Marconi
Instruments

2960

RADIO TEST SYSTEM
Option 30 for TACS

日本エレクトロ レント
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Programming Manual
Supplement 30

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Programming Manual

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Volume 1A
Supplement 30

RADIO TEST SYSTEM

2960

Option 30

for TACS

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ASSOCIATED PUBLICATIONS

Programming Manual	Part no. 46881-930Y
Programming Manual Supplements	(See the Preface.)
Operating Manual	Part no. 46881-900L
Operating Manual Supplements	(See the Operating Manual.)
Service Manual, 2960 Adapter	Part no. 46881-911T
Service Manual, 2955A and 2955R	Part no. 46881-954A

PREFACE

The Radio Test System 2960 consists of a Radio Communications Test Set 2955 series with a Multi-system Adapter. The Adapter includes software for one or more systems. The Adapter can accept up to six co-resident options. Four options are currently available as below.

Features which are common to all of the systems are described in the Programming Manual.

To describe features in which there are differences between systems, there is a Programming Manual Supplement for each system. The Supplement has the same number as the option as follows:-

Option no.	System	Supplement	
		No.	Part no.
10	NMT	10	46881-931N
20	AMPS	20	46881-932L
30	TACS	30	46881-933J
50	Band III	50	46881-935G

This Supplement is for Option 30 (TACS).

AMENDMENT STATUS

Each page bears the date of the original issue or the date and number of the latest amendment. Any changes subsequent to the latest amendment are included on Manual Change sheets coded C1, C2 etc.

WARNINGS AND CAUTIONS

See the Operating Manual.

Chapter 3

COMMAND CODES

INTRODUCTION TO COMMAND CODES FOR THE IMMEDIATE MODE

A test sequence can be run by using the following:-

Command code	Function	Syntax form	Data format
LOAd	Load a file from disc	2	1 digit
RUn	Run test sequence	1	-
TSi	Select test sequence	2	1 digit

The details of a test sequence can be displayed or printed by using the following:-

Command code	Function	Syntax form	Data format
CSl	Enable/disable continuous summary lines	2	1 digit
DFi	Set display format	2	1 digit
PRInt	Print to current printer port	4	2 & 2 digits & text/code
PRO	Set criteria for printing result of test routine	2	1 digit
SEqttl	Set title of user-defined test sequence	6	Text
WRite	Write to 2955 screen at x, y	4	2 & 2 digits & text/code

Communications parameters can be set by using the following:-

Command code	Function	Syntax form	Data format
BRi	Set baud rate for RS-232 port	2	1 digit
DSi	Set disc step rate	2	1 digit
ECho	Enable/disable RS-232 echo	2	1 digit
LPi	Set data length and parity of serial port	2	1 digit
PPi	Select printer port	2	1 digit
PTi	Select printer terminator	2	1 digit
PUrge	Clear RS-232 or GPIB buffer	1	-
SBi	Set number of stop bits	2	1 digit
SRq	Enable/disable service request	2	1 digit

When more than one system option is fitted, the current system can be changed and the setting can be read by using the following:-

Command code	Function	Syntax form	Data format
SYStem	Set system type	6	2 digits
	Read system type setting	1	-

Various test conditions can be set by using the following:-

Command code	Function	Syntax form	Data format
CCH	Set current control channel	2	4 digits
CCi	Set default control channel	2	4 digits
DEfault	Load default parameter data, execute any user-defined subroutine	1	-
Fvc	Set first voice channel	2	4 digits
HInc	Set handoff increment	2	4 digits
LVc	Set last voice channel	2	4 digits
PMi	Set pause mode	2	1 digit
VCh	Set current voice channel	2	4 digits

Various settings can be made and the settings can be read by using the following:-

Command code	Function	Syntax form	Data format
Aid	Set area identity number	6	5 digits
	Read area identity number	1	-
CRI	Set charge rate	2	4 digits
	Read charge rate setting	1	-
DCc	Set digital colour code	2	1 digit
	Read digital colour code	1	-
DSCc	Set DSAT colour code	2	1 digit
	Read DSAT colour code setting	1	
DTmf	Enable/disable DTMF test	2	1 digit
	Read DTMF test setting	1	-
HF	Enable/disable hook flash test	2	1 digit
	Read hook flash test setting	1	-
Min	Set mobile identity number	6	Number
	Read MIN	1	-
NFI	Set number format	2	1 digit
	Read number format setting	1	-
SCc	Set SAT colour code	2	1 digit
	Read SAT colour code setting	1	-

Various readings can be made by using the following:-

Command code	Function	Syntax form	Data format
ESn	Read equipment serial number	1	-
RD	Request a reading	2	3 digits
VMother	Read version of motherboard software	1	-
VPers	Read version of personality board software	1	-

Under the supervision of a Marconi Instruments representative, the memory can be read and set by using the following:-

Command code	Function	Syntax form	Data format
PEI	Peek I/O port and place contents in flag register	2	3 digits
PEM	Peek memory and place contents in flag register	2	5 digits
POI	Poke I/O port with data	5	3 & 3 digits
POM	Poke memory with data	5	5 & 3 digits

The mode can be changed by using the following:-

Command code	Function	Syntax form	Data format
CRTS	Change to CRTS mode	1	-
LEarn	Enter learn mode	1	-
LOCal	Go to local control mode from RS-232	1	-
NOrmal	Go to normal 2955 mode	1	-
USer	Enter user mode	1	-

Other operations can be carried out by using the following:-

Command code	Function	Syntax form	Data format
COMmand	Control 2955 directly in CRTS mode	7	-
CONtinue	Continue after pause	1	-
PAUse	Pause at end of current test routine	1	-
RECall	Recall settings	2	1 digit
SAve	Save current user-program on disc	2	1 digit
STOre	Store setting	2	1 digit
UPI	Read parallel control port user input lines	1	-
UPO	Set parallel control port user output lines	2	3 digits

INTRODUCTION TO COMMAND CODES FOR THE LEARN MODE AND THE USER MODE

A test routine can be programmed by using the following:-

Command code	Function	Syntax form	Data format
TEst	Execute following test routine	2	2 digits

The details of a test routine can be displayed or printed by using the following:-

Command code	Function	Syntax form	Data format
DFi	Set display format	2	1 digit
PRInt	Print to current printer port	4	2 & 2 digits & text/code
PRO	Set criteria for printing result of test routine	2	1 digit
WRite	Write to 2955 screen at x, y	4	2 & 2 digits & text/code

To display or print the details of a test routine, PRINT or WRITE precedes the following:-

Command code	Function	Syntax form	Data format
BUffer	Print printer array buffer	4	-
CLear	Clear printer array buffer	4	-
DIsable	Disable printing	4	-
ENAble	Enable printing	4	-
ESn	Print or write ESN	4	-
Indicator	Print or write test status indicator	4	-
LIne	Print first line of printer array buffer	4	-
Min	Print or write MIN	4	-
RESult	Print or write test routine result	4	-
SEqttl	Print or write test sequence title	4	-
STAtus	Print or write test routine status	4	-
SUMmary	Print or write test routine summary	4	-
TITle	Print or write current test routine title	4	-

Communications parameters can be set by using the following:-

Command code	Function	Syntax form	Data format
BRi	Set baud rate for RS-232 port	2	1 digit
PPi	Select printer port	2	1 digit
PTi	Select printer terminator	2	1 digit

Various test conditions can be set by using the following:-

Command code	Function	Syntax form	Data format
Aid	Set area identity number	6	5 digits
CCH	Set current control channel	2	4 digits
CCi	Set default control channel	2	4 digits
CRI	Set charge rate	2	4 digits
DCc	Set digital colour code	2	1 digit
DSCc	Set DSAT colour code	2	1 digit
DTmf	Enable/disable DTMF test	2	1 digit
Fvc	Set first voice channel	2	4 digits
HF	Enable/disable hook flash test	2	1 digit
HInc	Set handoff increment	2	4 digits
LVc	Set last voice channel	2	4 digits
NFI	Set number format	2	1 digit
PARameter	Set test routine parameters	3	2 & 1 digits & text
PMi	Set pause mode	2	1 digit
SCc	Set SAT colour code	2	1 digit
VCh	Set current voice channel	2	4 digits

In learn mode only, the loading of default parameter data and the executing of any user-defined subroutine can be invoked by using the following:-

Command code	Function	Syntax form	Data format
DEfault	Load default parameter data, execute any user-defined subroutine	1	-

Subroutines and alternative paths can be entered by using the following:-

Command code	Function	Syntax form	Data format
Gosub	Call subroutine at given label	2	3 digits
JBC	Jump to label if designated bit is clear	5	1 & 3 digits
JBS	Jump to label if designated bit is set	5	1 & 3 digits
JEq	Jump to label if value is equal to flag register	5	3 & 3 digits
JNe	Jump to label if value is not equal to flag register	5	3 & 3 digits
JOE	Jump to label on test error	2	3 digits
JOF	Jump to label on test failure	2	3 digits
JOP	Jump to label on test pass	2	3 digits
JUmp	Jump to label unconditionally	2	3 digits
LAbel	Marker for position in program	2	-
RETurn	Return from subroutine	1	-

Repetitions and loops can be invoked by using the following:-

Command code	Function	Syntax form	Data format
NExt	Next pass of repeat loop	1	-
NXtch	Next channel and next RPTCH loop	1	-
REPeat	Repeat a loop	2	3 digits
RPtch	Repeat loop from current to last voice channel	1	-
STPch	Step to next voice channel	1	-

Under the supervision of a Marconi Instruments representative, the memory can be read and set by using the following:-

Command code	Function	Syntax form	Data format
PEI	Peek I/O port and place contents in flag register	2	3 digits
PEM	Peek memory and place contents in flag register	2	5 digits
POI	Poke I/O port with data	5	3 & 3 digits
POM	Poke memory with data	5	5 & 3 digits

The exit from the learn mode or from the user mode is made by using the following:-

Command code	Function	Syntax form	Data format
END	End of program or user-defined subroutine, return to immediate mode	1	-

Other operations can be carried out by using the following:-

Command code	Function	Syntax form	Data format
COMmand	Control 2955 directly in CRTS mode	7	Text
Key	Wait for keypress and store value in flag register	1	-
WAit	Wait for n milliseconds	2	5 digits

DETAILS OF COMMAND CODES

Notes...

(1) The appropriate command codes are detailed below and summarized in Appendix 1. Information which is applicable to the learn mode is also applicable to the user mode except where otherwise stated.

(2) For the format, the number of digits is the maximum.

(3) In the examples, the information within parentheses is explanatory and should not be entered and does not appear on the screen.

(4) With a 2960, it is not possible to use programs which have been saved on disc from a 2958.

(5) A 2960 can be configured to use the same RD numbers as for the 2958. See the SYSTEM CONFIGURATION option under the MISCELLANEOUS MENU in the Operating Manual Supplement 30.

Aid (Area ID number)

Function: Set area identity number. The default number is 03592.
Token: DF.
Format: AID or A, followed by a 5-digit number within quotation marks.
Example: A "36166" (Set the area ID to 36166).
Modes: Immediate and learn.
Errors: Syntax (Invalid command).

Function: Read area identity number.
Format: AID or A, alone.
Use: To pass the area identity number to other equipment.
Modes: Immediate only.

BRi (Baud Rate Is)

Function: Set baud rate for RS-232 port. The default number is 4.
Token: 96.
Format: BRI or BR, followed by a 1-digit number:
0 = 75, 1 = 150, 2 = 300, 3 = 600, 4 = 1200, 5 = 2400, 6 = 4800, 7 = 9600.
Example: BR 6 (Set the baud rate to 4800).
Modes: Immediate and learn.
Errors: Syntax (Out of range, baud rate number is not 0 to 7).

BUffer

Function: Argument for PRINT, print printer array/buffer.
Token: E3.
Format: BUFFER or BU, immediately preceded by PRINT.
Modes: Learn only.

CCH (Control CHannel)

Function: Set current control channel.
Token: 8F.
Format: CCH followed by a 4-digit number.
Example: CCH 43 (Set the current control channel to 43).
Modes: Immediate and learn.
Errors: Syntax (Out of range, control channel number is not within minimum and maximum).

CCi (Control Channel Is)

Function: Set default control channel. The default number is 323. This only affects the data in the menus and not the current control channel. See CCH.
Token: 8E.
Format: CCI or CC, followed by a 4-digit number.
Example: CC 140 (Set the default control channel to 140).
Modes: Immediate and learn.
Errors: Syntax (Out of range, control channel number is not within minimum and maximum).

CLear

Function: Argument for PRINT, clear printer array/buffer.
Token: E2.
Format: CLEAR or CL, immediately preceded by PRINT.
Use: Fills the printer array/buffer with all spaces.
Modes: Learn only.

COMmand

Function: Control 2955 directly in CRTS modes.
Token: 9B.
Format: COMMAND or COM, followed by string of up to 40 characters terminated with <LF>.
Use: Passes a command code string, without checking, directly to the 2955.
Example: COM RX,RG,FR123.5MZ<LF> (Set the 2955 to the RECEIVER TEST mode with an RF generator frequency of 123.5 MHz).
Modes: Immediate and learn.

CONtinue

Function: Continue after pause.
Format: CONTINUE or CON, alone.
Use: Continues a test sequence following a PAUSE command.
Modes: Immediate only.

CRI (Charge Rate Is)

Function: Set charge rate. The default number is 0. A value of 0 disables the charge rate function.
Token: DC.
Format: CRI followed by a 4-digit charge rate in the range 0 to 1023.
Example: CRI 1003 (Set the charge rate to 1003).
Modes: Immediate and learn.
Errors: Syntax (Out of range, charge rate greater than 1023).

Function: Read charge rate setting.
Format: CRI alone.
Use: To pass the charge rate setting to other equipment.
Modes: Immediate only.

CRTS

Function: Change to CRTS modes from pass-through mode.
Format: CRTS alone.
Use: Transfers operation from 2955 to CRTS.
Modes: Immediate only.

CSl (Continuous Summary Lines enable/disable)

Function: Enable/disable output of summary line after a test routine. The default number is 0.
Format: CSL or CS, followed by a 1-digit number: 0 = disable, 1 = enable.
Use: Passes the last summary line to the GPIB port or the RS-232 port.
Example: CS 1 (Enable output of summary lines).
Modes: Immediate only.

DCc (Digital Colour Code)

Function: Set digital colour code. The default number is 0.
Token: DD.
Format: DCC or DC, followed by a 1-digit number in the range 0 to 3.
Example: DC 2 (Set the digital colour code to 2).
Modes: Immediate and learn.
Errors: Syntax (Out of range, digital colour code number is not 0 to 3).

Function: Read digital colour code.
Format: DCC or DC, alone.
Use: To pass the digital colour code to other equipment.
Modes: Immediate only.

DEfault

Function: Load default data for following test routines. Also, the 2960 executes any user-defined test subroutine which has been entered under USER.
Token: 82.
Format: DEFAULT or DE, alone.
Modes: Immediate and learn.
Errors: Syntax.

DFi (Display Format Is)

Function: Set display format. The default number is 1. The display format cannot be changed during a test sequence.
Token: 94.
Format: DFI or DF, followed by a 1-digit number: 0 = summary, 1 = full.
Use: Sets the display format for FULL AUTO TEST mode. In the GO/NO-GO TEST mode, the display format is always summary.
Example: DF 0 (Set the default display format to summary).
Modes: Immediate and learn.
Errors: Syntax (Out of range, display format number is not 0 or 1).

DIsable

Function: Argument for PRINT, disable printing.
Token: E0.
Format: DISABLE or DI, immediately preceded by PRINT.
Use: Causes all printing to be disabled. Followed by PRINT ENABLE to re-enable printing.
Modes: Learn only.

DSCc (Digital SAT Colour code)

Function: Set DSAT colour code. The default number is 0.
Token: D5.
Format: DSCC or DSC, followed by a 1-digit number in the range 0 to 6.
Example: DSC 2 (Set the DSAT colour code to 2).
Modes: Immediate and learn.
Errors: Syntax (Out of range, DSAT colour code number is not 0 to 6).

Function: Read DSAT colour code.
Format: DSCC or DSC, alone.
Use: To pass the DSAT colour code to other equipment.
Modes: Immediate only.

DSi (Disc Step rate Is)

Function: Set disc step rate. The default number is 0.
Format: DSI or DS, followed by a 1-digit number: 0 = 6 ms, 1 = 12 ms.
Use: Selects for different types of disc drive.
Example: DS 1 (Select 12 ms step rate).
Modes: Immediate only.

DTmf (DTMF enable/disable)

Function: Enable/disable DTMF tones test routine. The default number is 0.
Token: DB.
Format: DTMF or DT, followed by a 1-digit number: 0 = disable, 1 = enable.
Example: DT 1 (Enable the DTMF tones test).
Modes: Immediate and learn.
Errors: Syntax (Out of range, DTMF number is not 0 or 1).

Function: Read DTMF tones test setting.
Format: DTMF or DT, alone.
Use: To pass the DTMF tones test setting to other equipment.
Modes: Immediate only.

ECho (ECHO enable/disable)

Function: Enable/disable RS-232 echo. The default number is 0.
Format: ECHO or EC, followed by a 1-digit number: 0 = off, 1 = on.
Example: EC 1 (Enable the RS-232 echo).
Modes: Immediate only.

ENAble

Function: Argument for PRINT, enable printing.
Token: E1.
Format: ENABLE or ENA, immediately preceded by PRINT.
Use: Re-enables printing which has been halted by PRINT DISABLE.
Modes: Learn only.

END

Function: End of program or user-defined subroutine. The 2960 then returns to the immediate mode.
Token: FF.
Format: END alone.
Use: Used at the end of a program to enable exit from learn mode.
Modes: Learn only.

ESn (Equipment Serial Number)

Function: Read equipment serial number. The default entry consists of fifteen full stops.
Format: ESN or ES, alone.
Use: To pass the number of the unit under test to other equipment.
Example: ES (Send the equipment's serial number from the GPIB port or the RS-232 port).
Modes: Immediate only.

Function: Argument for PRINT or WRITE, print or write equipment serial number.
Token: F1.
Format: ESN or ES, preceded by either PRINT or WRITE.
Use: When preceded by PRINT, the ESN is sent to the printer port; when preceded by WRITE, the ESN is written on the screen.
Example: WR 3,9,ES (Write the mobile's equipment serial number on the screen at column 3, row 9).
Modes: Learn only.

Fvc (First Voice Channel)

Function: Set first voice channel. The default number is 1.
Token: 91.
Format: FVC or F, followed by a 4-digit number.
Example: F 50 (Set the default first voice channel to 50).
Modes: Immediate and learn.
Errors: Syntax (Out of range, voice channel number is not within minimum and maximum).

Gosub

Function: Call subroutine at given label.
Token: 89.
Format: GOSUB or G, followed by a 3-digit label number in the range 0 to 255.
Use: Temporarily transfers the program flow to the named destination. Subroutines can be nested to a depth of six. Followed by a RETURN command to resume the main program.
Example: G 30 (Transfer the program flow temporarily to LABEL 30).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

HF (Hook Flash enable/disable)

Function: Enable/disable hook flash test routine. The default number is 0.
Token: DA.
Format: HF followed by a 1-digit number: 0 = disable, 1 = enable.
Example: HF 1 (Enable the hook flash test routine).
Modes: Immediate and learn.
Errors: Syntax (Out of range, hook flash number is not 0 or 1).

Function: Read hook flash test setting.
Format: HF alone.
Use: To pass the hook flash test setting to other equipment.
Modes: Immediate only.

HInc (Handoff INCrement)

Function: Set default handoff increment. The default number is 300.
Token: 93.
Format: HINC or HI, followed by a 3-digit handoff increment in the range 1 to 180.
Example: HI 33 (Set the handoff increment to 33).
Modes: Immediate and learn.
Errors: Syntax (Out of range, maximum increment number is exceeded).

Indicator

Function: Argument for PRINT or WRITE, print or write test status indicator.
Token: EE.
Format: INDICATOR or I, preceded by either PRINT or WRITE.
Use: When preceded by PRINT, the status indicator (-, F or E) is sent to the printer port; when preceded by WRITE, it is written on the screen.
Example: WR 3,9,I (Write the status indicator for the last test routine on the screen at column 3, row 9.)
Modes: Learn only.

JBC (Jump if Bit Clear)

Function: Jump to label if designated bit in the flag register is clear.
Token: A4.
Format: JBC followed by a flag register bit number and a label number.
Use: If the numbered bit is logical 0, the program continues from the numbered label. The 8-bit flag register can contain the value for a key, the contents of a memory location or I/O port data.
Example: JBC 2,30 (If bit 2 is clear, jump to LABEL 30).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JBS (Jump if Bit Set)

Function: Jump to label if designated bit in the flag register is set.
Token: A5.
Format: JBS followed by a flag register bit number and a label number.
Use: If the numbered bit is logical 1, the program continues from the numbered label. The 8-bit flag register can contain the value for a key, the contents of a memory location or I/O port data.
Example: JBS 2,30 (If bit 2 is set, jump to LABEL 30).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JEq (Jump if EQual)

Function: Jump to label if first value is equal to contents of flag register.
Token: A6.
Format: JEQ or JE, followed by a 3-digit decimal number and a label number.
Use: If the contents of the flag register is equal to the decimal value given, the program continues from the numbered label. The 8-bit flag register can contain the value for a key, the contents of a memory location or I/O port data.
Example: JE 255,30 (If the contents of the flag register equal 255, jump to LABEL 30).
Modes: Learn only.

JNe (Jump if Not Equal)

Function: Jump to label if first value is not equal to contents of flag register.
Token: A7.
Format: JNE or JN, followed by a 3-digit decimal number and a label number.
Use: If the contents of the flag register is not equal to the decimal value given, the program continues from the numbered label. The 8-bit flag register can contain the value for a key, the contents of a memory location or I/O port data.
Example: JN 255,30 (If the contents of the flag register are not equal to 255, jump to LABEL 30).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JOE (Jump On Error)

Function: Jump to label on test routine error.
Token: A2.
Format: JOE followed by a label number.
Use: If an error occurs during the preceding test routine, the program continues from the numbered label.
Example: JOE 90 (If there is an error during the preceding test routine, jump to LABEL 90).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JOF (Jump On Failure)

Function: Jump to label on test routine failure.
Token: A3.
Format: JOF followed by a label number.
Use: If there is a failure in the preceding test routine, the program continues from the numbered label.
Example: JOF 99 (If the preceding test routine fails, jump to LABEL 99).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JOP (Jump On Pass)

Function: Jump to label on test routine pass.
Token: A1.
Format: JOP followed by a label number.
Use: If there is a pass in the preceding test routine, the program continues from the numbered label.
Example: JOP 99 (If the preceding test routine passes, jump to LABEL 99).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

JUmp

Function: Jump to label unconditionally.
Token: 86.
Format: JUMP or JU, followed by a label number.
Use: The program continues from the numbered label.
Example: JU 21 (Continue program execution from LABEL 21).
Modes: Learn only.
Errors: Syntax (Fatal, label not found).

Key

Function: Wait for keypress and store value in flag register.
Token: 9A.
Format: KEY or K, alone.
Use: Causes the program to wait until a key is pressed. The key code is then stored in the flag register for later testing. The values stored are as follows:-
0 = 2955, 1 = CRTS, 2 = DISC, 3 = PSOPH,
4 = TX, 5 = RX, 6 = DUPLEX, 7 = TONES,
8 = BAR CHART, blank or TX MON ON-OFF,
9 = SCOPE or SCOPE/BAR, 10 = HOLD DISPLAY, 11 = HELP.
Modes: Learn only.

LAbel

Function: Marker for position in program.
Token: 85.
Format: LABEL or LA, followed by a 3-digit number in the range 1 to 255.
Use: Provides a destination address for a GOSUB or JUMP.
Example: LA 30 (Identity of the following program subroutine).
Modes: Learn only.
Errors: Syntax.

LEarn

Function: Enter learn mode for a user-defined test sequence. The 2960 cannot then respond to immediate mode commands until END is received. For a user-defined subroutine, see USER. Either a test sequence or a subroutine can be defined, not both in memory together.
Format: LEARN or LE, alone.
Use: Precedes the first command in a user-defined program in order to enter the learn mode.
Modes: Immediate only.

LIne

Function: Argument for PRINT, print first line of printer array/buffer.
Token: E4.
Format: LINE or LI, immediately preceded by PRINT.
Modes: Learn only.

LOAd

Function: Load a file from disc. See Note (4) on page 3-7.
Format: LOAD or LOA, followed by a 1-digit file number.
Use: Loads a file from disc into the user-defined program area. File number range is 0 to 9.
Modes: Immediate only.

LOCal

Function: Go to local CRTS mode from RS-232.
Format: LOCAL or LOC, alone.
Use: Returns from RS-232 control to local control. For the GPIB, GTL or REN is used instead.
Modes: Immediate only.

LPi (Length and Parity Is)

Function: Set data length and parity of serial port. The default number is 5.
Format: LPI or LP, followed by 1-digit number: 0 = 7 even, 1 = 7 odd, 2 = 7 none, 3 = 8 even, 4 = 8 odd, 5 = 8 none.
Example: LP 5 (8 bits of data, no parity for serial port).
Modes: Immediate only.

LVc (Last Voice Channel)

Function: Set last voice channel. The default number is 600.
Token: 92.,
Format: LVC or LV, followed by a 4-digit number.
Example: LV 180 (Set the default last voice channel to 180).
Modes: Immediate and learn.
Errors: Syntax (Out of range, voice channel number is not within minimum and maximum).

Min (Mobile Identity Number)

Function: Set mobile identity number. The default number is 000-00-000000.
Format: MIN or M, followed by, within quotation marks, the mobile's telephone number in the form xxx-x-xxxxxx.
Example: M "123-4-567890" (My identity number is 123-4-567890).
Modes: Immediate only.

Function: Read mobile identity number.
Format: MIN or M, alone.
Use: To pass the MIN to other equipment.
Example: MIN (Send the mobile's identity number from the GPIB port or the RS-232 port).
Modes: Immediate only.

Function: Argument for PRINT or WRITE, print or write mobile identity number.
Token: F0.
Format: MIN or M, followed by either PRINT or WRITE.
Use: When preceded by PRINT, the MIN is sent to the printer port; when preceded by WRITE, the MIN is written on the screen.
Example: WR 3,9,M (Write the mobile's identity number on the screen at column 3, row 9).
Modes: Learn only.

NExt

Function: Next pass of repeat loop.
Token: 88.
Format: NEXT or NE, alone.
Use: NEXT follows REPEAT to initiate another loop.
Example:
```
REPEAT 2
TEST 21
NEXT     (Make 2 attempts at placing call to mobile).
```
Modes: Learn only.
Errors: Syntax.

NFI (Number Format Is)

Function: Set number format. The default number is 3.
Token: D9.
Format: NFI followed by 1-digit number:
0 = decimal, 1 = hexadecimal, 2 = octal, 3 = standard.
Use: Selects the number format for printing or screen display.
Example: NFI 1 (Format the numbers in hexadecimal).
Modes: Immediate and learn.
Errors: Syntax (Out of range, format number is not 0 to 3).

Function: Read number format setting.
Format: NFI alone.
Use: To pass the number format setting to other equipment.
Modes: Immediate only.

NOrmal

Function: Go to normal 2955 mode.
Format: NORMAL or NO, alone.
Use: Returns from remote CRTS mode to remote pass-through mode. To return to remote CRTS mode, use CRTS.
Modes: Immediate only.

NXtch (NeXT CHannel)

Function: Next voice channel and next RPTCH loop.
Token: 8D.
Format: NXTCH or NX, alone.
Use: NXTCH follows RPTCH to initiate another loop.
Example: RPTCH
TEST 23
TEST 6
NXTCH (Measure receiver distortion in the current to the last voice channels).
Modes: Learn only.

PARameter

Function: Set test routine parameters.
Token: 81.
Format: PARAMETER or PAR, followed by a 2-digit test routine number in the range 1 to 9, 20 to 25 or 27 to 34, then a 1-digit parameter number in the range range 1 to 4 and then data.
Example: PAR 6,1,28,26dB,-80dBm,2kHz (Set parameters for test routine no. 6 SINAD measurement, using a psophometric filter, with lower limit 26 dB, RF generator level -80 dBm and reference modulation level 2 kHz).
Modes: Learn only.
Errors: Syntax (Less than 3 fields found or fields contain non-ASCII codes).

PAUse

Function: Pause at end of current test routine.
Format: PAUSE or PAU, alone.
Modes: Immediate only.

PEI (PEek I/O port)

Function: Peek I/O port and place contents in flag register. This should not be used except under the supervision of a Marconi Instruments representative.
Token: 9D.
Format: PEI followed by a 3-digit port address (range 0 to 255).
Use: Reads the contents of the designated I/O port address and places the value in the 8-bit flag register for later testing.
Example: PEI 96 (Peek I/O port address 96 and place the contents in the flag register.)
Modes: Immediate and learn.
Errors: Syntax.

PEM (PEek Memory)

Function: Peek memory and place contents in flag register. This should not be used except under the supervision of a Marconi Instruments representative.
Token: 9E.
Format: PEM followed by a 5-digit memory address (range 0 to 65535).
Use: Reads the contents of the designated memory address and places the value in the 8-bit flag register for later testing.
Example: PEM 56320 (Peek memory address 56320 and place the contents in the flag register).
Modes: Immediate and learn.
Errors: Syntax.

PMi (Pause Mode Is)

Function: Set pause option. This cannot be changed during a test sequence.
Token: 95.
Format: PMI or PM, followed by a number: 0 = manual only, 1 = on failure, 2 = always.
Use: Selects the method of pausing after a test routine when in FULL AUTO TEST mode. In GO/NO-GO TEST mode, the pause is always manual only.
Example: PM 0 (Set the pause to manual only).
Modes: Immediate and learn.
Errors: Syntax (Out of range, pause mode number is not 0 to 2).

POI (POke I/O port)

Function: Poke I/O port with data. This should not be used except under the supervision of a Marconi Instruments representative.
Token: 9F.
Format: POI followed by a 3-digit port address and a 3-digit number in the range 0 to 255.
Example: POI 96,255 (Poke I/O address 96 with 255).
Modes: Immediate and learn.
Errors: Syntax.

POM (POke Memory)

Function: Poke memory with data. This should not be used except under the supervision of a Marconi Instruments representative.
Token: A0.
Format: POM followed by a 5-digit memory address in the range 0 to 65536 and a 3-digit number in the range 0 to 255.
Example: POM 56320,255 (Poke memory address 56320 with 255).
Modes: Immediate and learn.
Errors: Syntax.

PPi (Printer Port Is)

Function: Select printer port. The default number is 0.
Token: 97.
Format: PPI or PP, followed by a 1-digit number:
0 = unassigned, 1 = GPIB talk only, 2 = serial, 3 = parallel.
Example: PP 3 (Select the parallel printer port).
Modes: Immediate and learn.
Errors: Syntax (Out of range, printer port number is not 0 to 3).

PRInt

Function: Print to current printer port.
Token: 83.
Formats: PRINT followed by a message within quotation marks.
PRINT followed by a command code.
PRINT followed by 2-digit x and y co-ordinates and then a message within quotation marks.
PRINT followed by 2-digit x and y co-ordinates and then a command code.
Uses: Prints either directly to the printer port or inserted into a 10-row (0 to 9) by 80-column (0 to 79) array at the specified co-ordinates. The top left of the screen is 0,0.
Examples
1: PRI "WARNING" (Print WARNING on printer).
2: PRI 3,9,RESULT (Print the measurement result on the printer at column 3, row 9).
Modes: Immediate and learn (when quotation marks are used) or learn only (when a command code is used).
Errors: Syntax.

PRO (PRint On)

Function: Set criterion for printing result of test routine. The default number is 0.
Token: 99.
Format: PRO followed by a 1-digit number:
0 = off, 1 = all, 2 = fail, 3 = pass.
Example: PRO 3 (Print if the test routine is passed).
Modes: Immediate and learn.
Errors: Syntax (Out of range, print on mode number is not 0 to 3).

PTi (Printer Terminator Is)

Function: Select printer terminator. The default number is 0.
Token: 98.
Format: PTI or PT, followed by a 1-digit number:
0 = <CR> and <LF>, 1 = <LF> only, 2 = <CR> only.
Example: PT 0 (Printer terminator to be used is <CR> and <LF>).
Modes: Immediate and learn.
Errors: Syntax (Out of range, printer terminator number is not 0 to 2).

PUrge

Function: Clear the RS-232 or GPIB buffer.
Format: PURGE or PU, alone.
Modes: Immediate only.

RD (ReaD)

Function: Request a reading. See Note (5) on page 3-7.
Format: RD followed by a 3-digit number as listed in Table 3-1.
Modes: Immediate only.

RECall

Function: Recall one of stored 2960 settings. See also under STORE.
Format: RECALL or REC, followed by a 1-digit number in the range 0 to 6.
Use: Replaces current settings by previously stored settings.
Example: REC 6 (Recall the settings in store no. 6).
Modes: Immediate only.

REPeat

Function: Repeat a loop.
Token: 87.
Format: REPEAT or REP, followed by a 3-digit number of loops in the range 0 to 255.
Use: Repeats a loop n times, each loop being terminated by NEXT.
Example:
```
REP 2
TEST 21
NEXT    (Attempt placing call to mobile twice).
```
Modes: Learn only.
Errors: Syntax.

RESult

Function: Argument for PRINT or WRITE, print or write result of test routine.
Token: FC.
Format: RESULT or RES, preceded by either PRINT or WRITE.
Use: PRINT sends the result to the printer port; WRITE sends the result to the screen.
Example: WR 3,9,RES (Write the result of the last test routine on the screen at column 3, row 9).
Modes: Learn only.

TABLE 3-1 READ NUMBERS

RD number	Reading
0	Out of range.
1 to 38	2955 readings. See the 2955 Programming Manual.
39	Out of range.
40 to 49	Last 1 to 10 summary lines (40 for line 1 to 49 for line 10).
50	For 2958 compatible operation only, mobile identity number.
51	For 2958 compatible operation only, equipment serial number.
52	Result field.
53	Test routine title field.
54	Test routine passed/failed field.
55	Serial poll byte as follows:- 0 = Not applicable, 1 = Not applicable, 2 = System at start of a test sequence, 3 = System paused, waiting for run/continue, 4 = Busy, system is working, 5 = System error, 6 = SRQ - Service request, 7 = RDY - Data ready, asserted with SRQ.
56	Calibration error byte as follows:- 0 = Peak error, 1 = SAT error, 2 = ST error, 3 = LF error, 4 = DTMF error, 5 = Data error, 6 = Not applicable to TACS, 7 = Modem error.
57	Disc error byte as follows:- 0 = Successful completion, 1 = No disc inserted, 2 = Drive not ready, 3 = File locked, 4 = File deleted, 5 = Disc write protected, 6 = Disc fault, 7 = File number out of range, 8 = Disc fault default data (partial load data corrupted), 9 = Warning checksum failure, 10 = Warning different system, 11 = Warning software issue.
58	For normal 2960 operation, GPIB error byte as follows:- 0 = No errors, 1 = Invalid command, 2 = Syntax error, 3 = Out of range. For 2958 compatible operation, enable output of summary lines.
59	For normal 2960 operation, out of range. For 2958 compatible operation, disable output of summary lines.
60 to 99	Out of range.
100 to 109	2955 readings.
>109	Out of range

RETurn

Function: Return from subroutine.
Token: 8A.
Format: RETURN or RET, alone.
Use: RETURN follows GOSUB to resume the main program sequence.
Modes: Learn only.

RPtch (RePeaT CHannel)

Function: Repeat loop from current to last voice channel.
Token: 8C.
Format: RPTCH or RP, alone.
Use: Sets up a loop between itself and the following NXTCH. Each pass of the loop causes the current voice channel number to be incremented by the handoff increment. The process ends when the last voice channel has been reached.
Example:
```
RPTCH
TEST 23
TEST 6
NXTCH  (Measure receiver distortion in the current to the last
       voice channels).
```
Modes: Learn only.

RUn

Function: Run the test sequence. See Note (4) on page 3-7.
Format: RUN or RU, alone.
Modes: Immediate only.

SAve

Function: Save the current user-defined program on disc. See Note (4) on page 3-1.
Format: SAVE or SA, followed by a 1-digit file number.
Modes: Immediate only.

SBi (number of Stop Bits Is)

Function: Set number of stop bits. The default number is 0.
Format: SBI or SB, followed by a 1-digit number: 0 = 1, 1 = 2.
Uses: Sets the RS-232 port.
Example: SB 1 (Set the RS-232 port for 2 stop bits).
Modes: Immediate only.

SCc (SAT Colour Code)

Function: Set SAT colour code. The default number is 0.
Token: DE.
Format: SCC or SC, followed by a 1-digit number:
0 = 5.97 kHz, 1 = 6.00 kHz, 2 = 6.03 kHz.
Example: SC 2 (Set the SAT to 6.03 kHz).
Modes: Immediate and learn.
Errors: Syntax (Out of range, SAT number is not 0 to 2).

Function: Read SAT colour code.
Format: SCC or SC, alone.
Use: To pass the SAT colour code to other equipment.
Modes: Immediate only.

SEqttl (SEQuence TiTLe)

Function: Set title of user-defined test sequence. The default setting is NO SEQUENCE DEFINED.
Format: SEQTTL or SE, followed by the test sequence title of up to 22 characters within quotation marks. Since the 2955 character set is used for the title, use upper case for all letters with the exception of d, k, m, s and z.
Example: SE "MYPROG" (The title of the test sequence is MYPROG).
Modes: Immediate only.

Function: Argument for PRINT or WRITE, print or write test sequence title.
Token: FA.
Format: SEQTTL or SE, preceded by either PRINT or WRITE.
Use: PRINT sends the title to the printer port; WRITE sends the title to the screen.
Example: WR 3,9,SE (Write the test sequence title on the screen at column 3, row 9).
Modes: Learn only.

SRq (Service ReQuest enable/disable)

Function: Enable/disable service request. The default number is 0.
Format: SRQ or SR, followed by a single digit number: 0 = disable, 1 = enable.
Use: Enables and disables the remote service request function on the GPIB. In RS-232 control, SRQ has to be enabled.
Modes: Immediate only.

STAtus

Function: Argument for PRINT or WRITE, print or write test routine status.
Token: ED.
Format: STATUS or STA, preceded by either PRINT or WRITE.
Use: PRINT sends the status (PASSED, FAILED or ERROR) to the printer port; WRITE sends the status to the screen.
Example: WR 3,9,STA (Write the status of the last test routine on the screen at column 3, row 9.)
Modes: Learn only.

STOre

Function: Store the existing 2960 settings. See also under RECALL.
Format: STORE or STO, followed by a 1-digit number in the range 0 to 6.
Use: Makes existing settings available for future recall.
Example: STO 6 (Place existing settings in store no. 6).
Modes: Immediate only.

STPch (STeP CHannel)

Function: Step to next voice channel.
Token: 8B.
Format: STPCH or STP, alone.
Use: Enables the current voice channel to be increased by the handoff increment without using a loop.
Modes: Learn only.

SUMmary

Function: Argument for PRINT or WRITE, print or write test routine summary.
Token: EF.
Format: SUMMARY or SUM, preceded by either PRINT or WRITE.
Use: PRINT sends the summary to the printer port; WRITE sends the summary to the screen.
Example: WR 3,9,SUM (Write the summary for the last test routine on the screen at column 3, row 9).
Modes: Learn only.

SYStem (SYSTEM type)

Function: Set system type.
Format: SYSTEM or SYS, followed by, within quotation marks, a 2-digit number: 10 = NMT, 20 = AMPS, 30 = TACS, 50 = Band III.
Example: SYS "20" (Set the system to AMPS).
Modes: Immediate only.

Function: Read system type setting.
Format: SYSTEM or SYS, alone.
Use: To pass the system type setting to other equipment.
Modes: Immediate only.

TEST

Function: Execute the following test routine.
Token: 80.
Format: TEST or TE, followed by 2-digit test routine number in the ranges 1 to 9 and 20 to 34.
Example: TE 28 (Measure transmitter power).
Modes: Learn only.
Errors: Syntax.

TITle

Function: Argument for PRINT or WRITE, print or write test routine title.
Token: FB.
Format: TITLE or TIT, preceded by either PRINT or WRITE.
Use: PRINT sends the title to the printer port; WRITE sends the title to the screen.
Example: WR 3,9,TIT (Write the test routine title on the screen at column 3, row 9).
Modes: Learn only.

TSi (Test Sequence Is)

Function: Select current test sequence.
Format: TSI or TS, followed by a 1-digit number:
0 = Brief testing, 1 = Comprehensive testing,
2 = Call processing only, 3 = Call and RF testing,
4 = User-defined.
Example: TS 4 (Select the user-defined test sequence).
Modes: Immediate only.

UPI (User Port Input)

Function: Read parallel control port user input lines.
Format: UPI alone.
Use: Reads the user input lines on the PARALLEL CONTROL PORT connector.
Modes: Immediate only.

UPO (User Port Output)

Function: Set parallel control port user output lines.
Format: UPO followed by a 3-digit number in the range 000 to 015.
Use: Sets the user output lines on the PARALLEL CONTROL PORT connector to the specified number.
Example: UPO 15 (Set the user output lines to decimal 15 (binary 1111)).
Modes: Immediate only.

USer

Function: Enter user mode to define a subroutine. The 2960 cannot then respond to immediate mode commands until END is received. Whenever DEF is executed, the subroutine is also executed. Each internal test sequence is thus subject to modification by the user. Before END at the end of the subroutine, a RETURN command causes the 2960 to resume the test sequence. For a user-defined test sequence, see LEARN. Either a test sequence or a subroutine can be defined, not both in memory together.
Format: USER or US, alone.
Use: Has to precede the first command in a user-defined subroutine in order to enter the learn mode.
Modes: Immediate only.

VCh (Voice CHannel)

Function: Set default current voice channel.
Token: 90.
Format: VCH or VC, followed by a 4-digit number.
Example: VC 100 (Set the default current voice channel to 100).
Modes: Immediate and learn.
Errors: Syntax (Out of range, voice channel number is not within minimum and maximum).

VMother

Function: Read the software version number of the motherboard.
Format: VMOTHER or VM, alone.
Modes: Immediate only.

VPers

Function: Read the software version number of the personality board.
Format: VPERS or VP, alone.
Modes: Immediate only.

WAit

Function: Wait for n milliseconds.
Token: 9C.
Format: WAIT or WA, followed by a 5-digit number in the range 0 to 65535.
Use: Suspends program operation for up to 65.535 seconds.
Example: WA 10000 (Suspend program operation for 10.000 seconds).
Modes: Learn only.
Errors: Syntax.

WRite

Function: Argument for WRITE, write to the 2955 screen.
Token: 84.
Formats: WRITE or WR, followed by 2-digit x and y co-ordinates and then a message within quotation marks.
WRITE or WR, followed by 2-digit x and y co-ordinates and then a command code.
Uses: Writes to the screen at row x (0 to 31), column y (0 to 39). The top left of the screen is 0,0.
Examples
1: WRITE 3,9,"WARNING" (Write WARNING on screen at column 3, row 9).
2: WRITE 3,9,RESULT (Write a measurement result on the screen at column 3, row 9).
Modes: Immediate and learn (when quotation marks are used) or learn only (when a command code is used).
Errors: Syntax.

Chapter 4

TEST ROUTINE PARAMETERS

TEST ROUTINE NO. 1 - TRANSMITTER RF POWER

Parameters 1, 2 and 3 can be selected from the following:-

Parameter	Setting	Entry	Default
1	RV & ME UL & LL	0 (xxxxxx00) or 1 (xxxxxx01)	1
2	RV or UL	10 mW to 100 W, 10 to 44 dBm, -20 to 14 dBW	6.5 dBW
3	ME	0 to 100%, 0 to 30 dB	
	ME (and RV ± ME) or LL	10 mW to 100 W, 10 to 44 dBm, -20 to 14 dBW	0.5 dBw

TEST ROUTINE NO. 2 - TRANSMITTER RF FREQUENCY

Parameters 1, 2 and 3 can be selected from the following:-

Parameter	Setting	Entry	Default
1		a + b where	3
	RV & ME	a = 0 (xxxxxx00)	
	UL & LL	or 1 (xxxxxx01)	
	RV & ME (CC)	or 3 (xxxxxx11)	(= 3
	Cellular radio	b = 0 (0xxxxxxx)	+ 0)
	PMR	or 128 (1xxxxxxx)	
2	RV or UL (Not applicable to RV & ME (CC))	1.5 to 1000 MHz	
3	ME	0 to 100%, 0 to 1000 ppm	Except J-TACS & N-TACS: 2.3 kHz
	ME (and RV ± ME) or LL	0 to 1000 MHz	J-TACS & N-TACS wideband: 2.8 kHz N-TACS narrowband: 1.9 kHz

TEST ROUTINE NO. 3 - TRANSMITTER AF DISTORTION, TRANSMITTER SINAD, TRANSMITTER S/N AND TRANSMITTER RESIDUAL NOISE

Parameter 3 is not used so parameter 4 is entered after parameter 2. Parameters 1, 2 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1		a + b where	23
	Distortion	a = 0 (xx00xx00)	
	SINAD	or 16 (xx01xx00)	
	SINAD (Distortion)	or 19 (xx01xx11)	(= 19
	S/N	or 32 (xx10xx00)	
	Residual noise	or 48 (xx11xx00)	
	15 kHz LP filter	b = 0 (xxxx00xx)	
	0.3 to 3.4 kHz filter	or 4 (xxxx01xx)	+ 4)
	300 Hz LP filter (for noise only)	or 8 (xxxx10xx)	
2	Distortion UL	0 to 30%	
	SINAD or S/N LL	0 to 50 dB	26 dB
	Residual noise UL	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	
4	Modulation for distortion, SINAD or S/N	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	Except N-TACS narrowband: 2.3 kHz N-TACS narrowband: 1.5 kHz

TEST ROUTINE NO. 4 - TRANSMITTER MODULATION LIMITING

Parameters 2, 3 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1			0
2	UL (maximum deviation)	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	Except N-TACS narrowband: 9.5 kHz N-TACS narrowband: 5.0 kHz
3	Overload factor	0 to 30 dB	20 dB
4	Modulation (same units as parameter 2)	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	Except N-TACS narrowband: 5.7 kHz N-TACS narrowband: 3.0 kHz

TEST ROUTINE NO. 5 - TRANSMITTER MODULATION COMPRESSION RATIO

Parameters 1, 2, 3 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1	RV & ME UL & LL	0 (xxxxxx00) or 1 (xxxxxx01)	0
2	RV or UL	0 to 10	2
3	ME ME (and RV ± ME) or LL	0 to 100% 0 to 10	10%
4	Modulation	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	Except N-TACS narrowband: 2.3 kHz N-TACS narrowband: 1.5 kHz

TEST ROUTINE NO. 6 - RECEIVER DISTORTION, RECEIVER SINAD AND RECEIVER S/N

Parameters 1, 2, 3 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1		a + b where	23
	Distortion	a = 0 (xx00xx00)	
	SINAD	or 16 (xx01xx00)	
	SINAD (Distortion)	or 19 (xx01xx11)	(= 19
	S/N	or 32 (xx10xx00)	
	15 kHz LP filter	b = 0 (xxxx00xx)	
	0.3 to 3.4 kHz filter	or 4 (xxxx01xx)	+ 4)
	Psophometric filter	or 12 (xxxx11xx)	
2	Distortion UL SINAD or S/N LL	0 to 30% 0 to 50 dB	24 dB
3	RF level	0.023 to 22 μV, -140 to -80 dBm	-80 dBm
4	Modulation	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	Except N-TACS narrowband: 2.3 kHz N-TACS narrowband: 1.5 kHz

TEST ROUTINE NO. 7 - RECEIVER SENSITIVITY

Parameters 1, 2, 3 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1	15 kHz LP filter 0.3 to 3.4 kHz filter Psophometric filter	0 (xxxx00xx) or 4 (xxxx01xx) or 12 (xxxx11xx)	12
2	RF level UL	0.023 to 22 μV, -140 to -80 dBm	Except J-TACS & N-TACS: -113 dBm J-TACS & N-TACS: -116 dBm
3	Reference SINAD	0 to 50 dB	Except J-TACS & N-TACS: 20 dB J-TACS & N-TACS: 12 dB
4	Modulation	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	Except J-TACS & N-TACS: 5.7 kHz J-TACS & N-TACS: 3.0 kHz

TEST ROUTINE NO. 8 - RECEIVER DEMODULATION EXPANSION RATIO

Parameters 1, 2, 3 and 4 can be selected from the following:-

Parameter	Setting	Entry	Default
1	RV & ME UL & LL	0 (xxxxxx00) or 1 (xxxxxx01)	0
2	RV or UL	0 to 10	2
3	ME ME (and RV ± ME) or LL	0 to 100% 0 to 10	10%
4	Modulation	100 Hz to 25 kHz, 1 to 70%, 0.1 to 10 rad	Except J-TACS & N-TACS: 2.3 kHz J-TACS & N-TACS: 1.5 kHz

TEST ROUTINE NO. 9 - DC POWER CONSUMPTION

Parameters 1, 2 and 3 can be selected from the following:-

Parameter	Setting	Entry	Default
1	RV & ME	0 (xxxxxx00)	
	UL & LL	or 1 (xxxxxx01)	1
2	RV or UL	100 mW to 200 W	100 W
3	ME	0 to 100%	
	ME (and RV ± ME) or LL	100 mW to 200 W	200 mW

TEST ROUTINE NO. 20 - REGISTRATION

Parameter 1 can be selected from the following:-

Setting	Entry	Default
RF level -80 dBm	0 (xxxxxx00)	
RF level -60 dBm	or 1 (xxxxxx01)	
RF level Except J-TACS & N-TACS: -40 dBm J-TACS & N-TACS: -60 dBm	or 2 (xxxxxx10)	2

TEST ROUTINE NO. 21 - CALL FROM CELL TO MOBILE

Parameter 1 can be selected from the following:-

Setting	Entry	Default
	a + b + c where a = 0 (xxx0xxxx)	18
Set control port bit 3 to request mobile to answer call and reset to 0 when call is answered	or 16 (xxx1xxxx)	(= 16
RF level -80 dBm	b = 0 (xxxxxx00)	
RF level -60 dBm	or 1 (xxxxxx01)	
RF level Except J-TACS & N-TACS: -40 dBm J-TACS & N-TACS: -60 dBm	or 2 (xxxxxx10)	+ 2
N-TACS initial voice channel: As under SYSTEM CONFIGURATION word	c = 0 (000xxxxx)	+ 0)
Narrowband channel	or 32 (001xxxxx)	
Wideband channel	or 128 (100xxxxx)	

TEST ROUTINE NO. 22 - CALL FROM MOBILE TO CELL

Parameter 1 can be selected from the following:-

Setting	Entry	Default
	a + b + c where	18
	a = 0 (xxx0xxxx)	
Set control port bit 1 to instruct mobile to make a call and reset to 0 when call is made	or 16 (xxx1xxxx)	(= 16
RF level -80 dBm	b = 0 (xxxxxx00)	
RF level -60 dBm	or 1 (xxxxxx01)	
RF level Except J-TACS & N-TACS: -40 dBm		
J-TACS & N-TACS: -60 dBm	or 2 (xxxxxx10)	+ 2
N-TACS initial voice channel: As under SYSTEM CONFIGURATION word	c = 0 (000xxxxx)	+ 0)
Narrowband channel	or 32 (001xxxxx)	
Wideband channel	or 128 (100xxxxx)	

TEST ROUTINE NO. 23 - HANDOFF

Parameters 1 can be selected from the following:-

Setting	Entry	Default
	a + b where	1
No change in SCC or DSCC at handoff	a = 0 (xxxxxxx0)	
Increment SCC or DSCC on each handoff	or 1 (xxxxxxx1)	(= 1
N-TACS handoff voice channel: As under SYSTEM CONFIGURATION word	b = 0 (000xxxxx)	+ 0)
Narrowband channel	or 32 (001xxxxx)	
Toggle channel type	or 128 (100xxxxx)	

TEST ROUTINE NO. 24 - AUTOMATIC HANDOFF

Parameters 1 can be selected from the following:-

Setting	Entry	Default
	a + b where	1
No change in SCC or DSCC at handoff	a = 0 (xxxxxxx0)	
Increment SCC or DSCC on each handoff	or 1 (xxxxxxx1)	(= 1
N-TACS handoff voice channel: As under SYSTEM CONFIGURATION word	b = 0 (000xxxxx)	+ 0)
Narrowband channel	or 32 (001xxxxx)	
Toggle channel type	or 128 (100xxxxx)	

TEST ROUTINE NO. 25 - SAT TRANSPONDING

Parameters 1 and 2 can be selected from the following:-

Parameter	Setting	Entry	Default
1	Transponding only	0 (xxxxxx00)	
	Transponding and deviation	or 1 (xxxxxx01)	1
	Transponding and frequency	or 2 (xxxxxx10)	
2	Deviation or frequency ME	Value in % or Hz	20%

TEST ROUTINE NO. 26 - CLEAR DOWN FROM CELL

No parameters can be selected.

TEST ROUTINE NO. 27 - CLEAR DOWN FROM MOBILE

Parameter 1 can be selected from the following:-

Setting	Entry	Default
	0 (xxx0xxxx)	
Set control port bit 2 to request mobile to clear down and reset to 0 when call is cleared	or 16 (xxx1xxxx)	16

TEST ROUTINE NO. 28 - MOBILE RF POWER

There are different power levels and classes (assuming an antenna gain of 1.5 dB with respect to a half-wave dipole) as follows:-

Power level	Power - Except J-TACS and N-TACS				Power - J-TACS and N-TACS		
	Class 1	Class 2	Class 3	Class 4	Class 1	Class 2	Class 3
0	7.08 W	2.82 W	1.12 W	447 mW	2.82 W	1.12 W	447 mW
1	1.12 W	1.12 W	1.12 W	447 mW	1.12 W	1.12 W	447 mW
2	447 mW	447 mW	447 mW	447 mW	447 mW	447 mW	447 mW
3	178 mW	178 mW	178 mW	178 mW	178 mW	178 mW	178 mW
4	70.8 mW	70.8 mW	70.8 mW	70.8 mW	70.8 mW	70.8 mW	70.8 mW
5	28.2 mW	28.2 mW	28.2 mW	28.2 mW	28.2 mW	28.2 mW	28.2 mW
6	11.2 mW	11.2 mW	11.2 mW	11.2 mW	11.2 mW	11.2 mW	11.2 mW
7	4.47 mW	4.47 mW	4.47 mW	4.47 mW	4.47 mW	4.47 mW	4.47 mW
SCM	xx00	xx01	xx10	xx11	xx00	xx01	xx10

Parameters 1 to 3 can be selected from the following:-

Parameter	Setting	Entry	Default
1		a + b + c where	8
	Power level 0	a = 0 (xxxx0000)	
	Power level 1	or 1 (xxxx0001)	
	Power level 2	or 2 (xxxx0010)	
	Power level 3	or 3 (xxxx0011)	
	Power level 4	or 4 (xxxx0100)	
	Power level 5	or 5 (xxxx0101)	
	Power level 6	or 6 (xxxx0110)	
	Power level 7	or 7 (xxxx0111)	
	Test all power levels	b = 8 (xxxx1000)	
	Units: W	c = 0 (xx00xxxx)	
	Units: dBW	or 16 (xx01xxxx)	
	Units: dBm	or 32 (xx10xxxx)	
2	Highest power level, UL	Value and dB or %	Except J-TACS & N-TACS: 2 dB J-TACS & N-TACS: 0.8 dB
3	Highest power level, LL	Value and dB or %	Except J-TACS & N-TACS: -4 dB J-TACS & N-TACS: -3 dB
4	Other power levels, UL	Value and dB or %	2 dB
5	Other power levels, LL	Value and dB or %	-4 dB

TEST ROUTINE NO. 29 - DATA PERFORMANCE

Parameters 2 and 3 can be selected from the following:-

Parameter	Setting	Entry	Default
2	LL	0 to 100%	95%
3	RF generator level	-80 to -146 dBm	-113 dBm

TEST ROUTINE NO. 30 - DTMF TONES

Parameter 1 can be selected from the following:-

Setting	Entry	Default
Disable printing of summary line and scrolling in summary display when test routine is disabled	0 (xxxxxxx0)	0
Enable printing of summary line and scrolling in summary display when test routine is disabled	or 1 (xxxxxxx1)	

TEST ROUTINE NO. 31 - HOOK FLASH

Parameter 1 can be selected from the following:-

Setting	Entry	Default
Disable printing of summary line and scrolling in summary display when test routine is disabled	0 (xxxxxxx0)	0
Enable printing of summary line and scrolling in summary display when test routine is disabled	or 1 (xxxxxxx1)	

TEST ROUTINE NO. 32 - DATA DEVIATION

This is available for user-defined test sequences.

Parameter 2 can be selected from the following:-

Setting	Entry	Default
ME	0 to 100%, 0 to 6.4 kHz	10%

TEST ROUTINE NO. 33 - SIGNALLING TONE DEVIATION

This is available for user-defined test sequences.

Parameter 2 can be selected from the following:-

Setting	Entry	Default
ME	0 to 100%, 0 to 6.4 kHz	10%

TEST ROUTINE NO. 34 - SIGNALLING TONE DURATION

This is available for user-defined test sequences.

Parameter 2 can be selected from the following:-

Setting	Entry	Default
ME	0 to 100%, 0 to 10 s	10%

Chapter 5

BUILT-IN TEST SEQUENCES

Notes...

(1) The built-in test sequences are listed below in detail to enable them to be used as programming examples. Also, sections can be abstracted and used, after modification, in user-defined test sequences.

(2) Common subroutines 0, 1, 2, 3, 25, 40, 50, 60, 95, 98 and 99 are given after the four test sequences.

CALL PROCESSING ONLY SEQUENCE

```
GOSUB 40                                  Put up heading and prepare buffer
PRINT 3,1,"CALL PROCESSING ONLY"
GOSUB 50                                  Perform registration and output buffer
GOSUB 60                                  Do common place call from mobile
TEST 24                                   Automatic handoff
JUMP 99                                   Skip on to common exit
```

CALL AND RF TESTING SEQUENCE

```
GOSUB 40                                  Put up heading and prepare buffer
PRINT 3,1,"CALL AND RF TESTING"
GOSUB 50                                  Perform registration and output buffer
GOSUB 60                                  Do common place call from mobile
GOSUB 1                                   Print one blank line
PRINT "HANDOFF/CHANNEL<7 SPACES>TX POWER PL 0
      <10 SPACES>TX FREQ<10 SPACES>SAT DEVIATION"
PRINT "---------------<7 SPACES>------------
      <10 SPACES>-------<10 SPACES>------------"
GOSUB 1                                   Print one blank line
RPTCH                                     Handoff to new channel
PRINT CLEAR                               Clear buffer
PRINT DISABLE
TEST 23                                   Handoff
JOP 30                                    Skip on if OK
PRINT ENABLE
PRINT "*** HANDOFF FAILED ***"
JUMP 99                                   Skip on to common exit
LABEL 30
PRINT 0,0,RESULT
PAR 28,1,0                                Set Tx RF power parameters
TEST 28                                   Measure Tx power level 0
PRINT 20,0,IND
PRINT 22,0,RESULT
TEST 2                                    Measure Tx RF frequency
PRINT 40,0,IND
PRINT 42,0,RESULT
TEST 25                                   Transponded SAT
```

```
PRINT 60,0,IND
PRINT 62,0,RESULT
PRINT ENABLE
PRINT LINE
NXTCH                                   Go round again for next channel
JUMP 95                                 Skip on to common exit
```

BRIEF TESTING SEQUENCE

```
GOSUB 40                                Put up heading and prepare buffer
PRINT 3,1,"BRIEF TESTING"
GOSUB 50                                Perform registration and output buffer
GOSUB 60                                Do common place call from mobile
GOSUB 1                                 Print one blank line
PRINT "<5 SPACES>TEST<15 SPACES>LOW CHANNEL
      <9 SPACES>MID CHANNEL<9 SPACES>HIGH CHANNEL"
PRINT "<5 SPACES>----<15 SPACES>-----------
      <9 SPACES>-----------<9 SPACES>------------"
GOSUB 1                                 Print one blank line
PRINT DISABLE
STPCH                                   Start by handoff to first channel
TEST 23                                 Handoff from current channel
PRINT 0,0,TITLE
PRINT 23,0,RESULT
PRINT 20,0,IND
JOF 13                                  Skip on if handoff failed
JOE 13
GOSUB 25                                Transponded SAT deviation
PRINT 0,1,TITLE
PRINT 23,1,RESULT
PRINT 20,1,IND
TEST 25                                 Measure SAT frequency
PRINT 0,2,TITLE
PRINT 23,2,RESULT
PRINT 20,2,IND
PRINT 0,3,"TX POWERS"
TEST 28                                 Measure Tx RF power
JOP 10
PRINT 14,3,TITLE
PRINT 14,3,"<6 SPACES>F "
PRINT 28,3,RESULT
JUMP 11
LABEL 10
PRINT 23,3,"ALL PASSED"
LABEL 11
TEST 2                                  Measure Tx RF frequency
PRINT 0,4,TITLE
PRINT 23,4,RESULT
PRINT 20,4,IND
TEST 3                                  Measure Tx AF noise
PRINT 0,5,TITLE
PRINT 23,5,RESULT
PRINT 20,5,IND
TEST 4                                  Measure Tx modulation limiting
PRINT 0,6,TITLE
PRINT 23,6,RESULT
```

```
PRINT 20,6,IND
TEST 6                                  Measure Rx distortion
PRINT 0,8,TITLE
PRINT 23,8,RESULT
PRINT 20,8,IND
TEST 7                                  Measure Rx sensitivity
PRINT 0,9,TITLE
PRINT 23,9,RESULT
PRINT 20,9,IND
LABEL 13
NXTCH                                   Go round again for next channel
TEST 23                                 Handoff
PRINT 43,0,RESULT
PRINT 40,0,IND
JOF 17
JOE 17
GOSUB 25                                Transponded SAT deviation
PRINT 43,1,RESULT
PRINT 40,1,IND
TEST 25                                 Transponded SAT frequency
PRINT 43,2,RESULT
PRINT 40,2,IND
TEST 28                                 Measure Tx RF power
JOP 14
PRINT 34,3,TITLE
PRINT 34,3,"<6 SPACES>F "
PRINT 48,3,RESULT
JUMP 15
LABEL 14
PRINT 43,3,"ALL PASSED"
LABEL 15
TEST 2                                  Measure Tx RF frequency
PRINT 43,4,RESULT
PRINT 40,4,IND
TEST 3                                  Measure Tx noise
PRINT 43,5,RESULT
PRINT 40,5,IND
TEST 4                                  Measure Tx modulation limiting
PRINT 43,6,RESULT
PRINT 40,6,IND
TEST 6                                  Measure Rx distortion
PRINT 43,8,RESULT
PRINT 40,8,IND
TEST 7                                  Measure Rx sensitivity
PRINT 43,9,RESULT
PRINT 40,9,IND
LABEL 17
NXTCH                                   Go round again for next channel
TEST 23                                 Handoff from current channel
PRINT 63,0,RESULT

PRINT 60,0,IND
JOF 21
JOE 21
GOSUB 25                                Transponded SAT deviation
PRINT 63,1,RESULT
PRINT 60,1,IND
```

```
TEST 25                                  Measure SAT frequency
PRINT 63,2,RESULT
PRINT 60,2,IND
TEST 28                                  Measure Tx RF power
JOP 18
PRINT 54,3,TITLE
PRINT 54,3,"<6 SPACES>F "
PRINT 68,3,RESULT
PRINT 78,3,""
JUMP 19
LABEL 18
PRINT 63,3"ALL PASSED"
LABEL 19
TEST 2                                   Measure Tx RF frequency
PRINT 63,4,RESULT
PRINT 60,4,IND
TEST 3                                   Measure Tx AF distortion
PRINT 63,5,RESULT
PRINT 60,5,IND
TEST 4                                   Measure Tx modulation limiting
PRINT 63,6,RESULT
PRINT 60,6,IND
TEST 6                                   Measure Rx distortion
PRINT 63,8,RESULT
PRINT 60,8,IND
TEST 7                                   Measure Rx sensitivity
PRINT 63,9,RESULT
PRINT 60,9,IND
LABEL 21
PRINT ENABLE                             Print results
PRINT BUFFER
JUMP 95                                  Skip on to common exit
```

COMPREHENSIVE TESTING SEQUENCE

```
GOSUB 40                          Put up heading and prepare buffer
PRINT 3,1,"COMPREHENSIVE TESTING"
GOSUB 50                          Perform registration and output buffer
GOSUB 60                          Do common place call from mobile
TEST 29                           Data performance (tested once only)
RPTCH                             Handoff to new channel (for testing on
                                  all channels required)

PRINT CLEAR
GOSUB 1                           Print one blank line
PRINT " NEW VOICE CHANNEL"
PRINT " -----------------"
TEST 23                           Handoff from current channel
JOF 99                            If failed skip on to end
JOE 99                            If error skip on to end
GOSUB 25                          Transponded SAT deviation
TEST 25                           SAT frequency
PAR 28,1,7                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 7
TEST 9                            Measure DC power level 7
PAR 28,1,6                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 6
TEST 9                            Measure DC power level 6
PAR 28,1,5                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 5
TEST 9                            Measure Dc power level 5
PAR 28,1,4                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 4
TEST 9                            Measure DC power level 4
PAR 28,1,3                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 3
TEST 9                            Measure DC power level 3
PAR 28,1,2                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 2
TEST 9                            Measure DC power level 2
PAR 28,1,1                        Set Tx  RF power parameters
TEST 28                           Measure Tx power level 1
TEST 9                            Measure DC power level 1
PAR 28,1,0                        Set Tx RF power parameters
TEST 28                           Measure Tx power level 0
TEST 9                            Measure DC power level 0
TEST 2                            Measure Tx RF frequency
PAR 3,1,23,26dB                   Set Tx distortion parameters
TEST 3                            Measure Tx noise
PAR 3,1,56,300Hz                  Measure Tx residual noise
TEST 3                            Measure Tx noise
TEST 4                            Measure Tx modulation limiting
TEST 5                            Measure Tx compression
TEST 6                            Measure Rx distortion
TEST 7                            Measure Rx sensitivity
TEST 8                            Measure Rx expansion
NXTCH                             Go round again for next channel
GOSUB 2                           Print two blank lines
TEST 26                           Clear from cell
TEST 9                            Measure quiescent DC power
JUMP 98                           Skip on the common exit
```

COMMON SUBROUTINES

Subroutines 0 to 3

```
LABEL 3                                 Print three blank lines
PRINT ""
LABEL 2                                 Print two blank lines
PRINT ""
LABEL 1                                 Print one blank line
PRINT ""
LABEL 0
RETURN
```

Subroutine 25

```
LABEL 25
PAR 25,1,1,20%                          Set SAT deviation parameters
TEST 25                                 Transponded SAT deviation
PAR 25,1,2,10 Hz                        Set SAT frequency parameters
RETURN
```

Subroutine 40

```
LABEL 40                                Heading and prepare buffer
PRINT "MARCONI INSTRUMENTS TACS CELLULAR RADIO TEST SYSTEM"
PRINT "--------------------------------------------------"
GOSUB 1                                 Print one blank line
DEF                                     Default parameters
PRINT CLEAR
RETURN
```

Subroutine 50

```
LABEL 50                                Registration
PRINT DISABLE
TEST 20                                 Registration of mobile
PRINT 2,7,"DATE:..............."
PRINT 40,7,"TESTER:..............."
JOP 51
PRINT 3,4,"*** REGISTRATION FAILED ***"
JUMP 52
LABEL 51
PRINT 3,3,"ESN:"
PRINT 8,3,ESN
PRINT 3,5,"MIN:"
PRINT 8,5,MIN
LABEL 52
PRINT ENABLE
PRINT BUFFER
PRINT CLEAR
RETURN
```

Subroutine 60

```
LABEL 60                                Common placce call from mobile tests
STPCH                                   Start on first traffic channel
REPEAT 2                                Make two attempts
TEST 22                                 Place call from mobile
JOP 61                                  Skip on if passed
NEXT
PRINT "***SOME TESTS ABORTED***"
JUMP 62                                 Miss next test if failed
LABEL 61                                Continue tests requiring user
                                        intervention
TEST 30                                 DTMF test
TEST 31                                 Hook flash test
TEST 27                                 Clear from mobile
LABEL 62                                Call mobile
REPEAT 2                                Make two attempts
TEST 21                                 Call from cell to mobile
JOP 60                                  If passed, skip on
NEXT                                    Else try again
RETURN
```

Subroutine 95

```
GOSUB 1                                 Print one blank line
PRINT CLEAR                             Clear text buffer
PRINT 40,0,"F = FAILURE, E = ERROR"
PRINT LINE
```

Subroutine 99

```
LABEL 99
GOSUB 2                                 Print two blank lines
TEST 26                                 Clear from MTX
```

Subroutine 98

```
LABEL 98
GOSUB 3                                 Print three blank lines
PRINT CLEAR                             Clear text buffer
PRINT 25,0,"TEST SUMMARY:"
PRINT 39,0,SUM
PRINT LINE
PRINT "<FF>"                            Print a form feed (0C hexadecimal)
END
```

Chapter 6

SAMPLE PROGRAMS

USING A GPIB CONTROLLER

To use a typical controller for a user-defined test sequence with redefined test routine parameters, a sample program is given below. The 2960 has to be in the remote CRTS mode.

```
SEQTTL 'USER DEFINED EXAMPLE'          Define test sequence title
LEARN                                  Enter learn mode to define sequence
GOSUB 40                               Put up heading and clear buffer
PRINT 3,1,'CALL PROCESSING ONLY'
GOSUB 50                               Do registration and output buffer
GOSUB 60                               Do common place call from mobile
TEST 24                                Automatic handoff
JUMP 99                                Then skip to common exit
LABEL 40                               Put up heading/clear buffer routine
PRINT 'MARCONI INSTRUMENTS TACS CELLULAR RADIO TEST SYSTEM'
PRINT '-------------------------------------------------'
PRINT''                                Blank line
DEF                                    Set default parameters
PRINT CLEAR RETURN                     Clear buffer then return
LABEL 50                               Do registration and output buffer
PRINT DISABLE                          Disable printer
TEST 20                                Perform registration
PRINT 2,7,'DATE:.............'
PRINT 40,7,'TESTER:.............'
JOP 51                                 Skip on if passed
PRINT 3,4,'*** REGISTRATION FAILED ***'
JUMP 52                                Failed, so skip ESN print routine
LABEL 51                               ESN and MIN print routine
PRINT 3,3,'ESN:'
PRINT 8,3,ESN
PRINT 3,5,'MIN:'
PRINT 8,5,MIN
LABEL 52                               Print buffer routine
PRINT ENABLE PRINT BUFFER RETURN       Enable and print buffer then return
LABEL 60                               Do common place call from mobile
VCH 300                                Start at centre frequency
REPEAT 2                               Make two attempts
TEST 22                                Place call from mobile
JOP 61                                 Skip on if passed
NEXT                                   Else try again
PRINT '*** CLEAR FROM MS ABORTED ***'
JUMP 62                                Miss next test if failed
LABEL 61
TEST 30                                Perform DTMF
TEST 31                                Perform hook flash
TEST 27                                Clear from mobile
LABEL 62                               Call mobile
REPEAT 2                               Make two attempts
TEST 21                                Call from cell
JOP 63                                 Skip on if passed
```

```
NEXT                                    Else try again
LABEL 63 RETURN
LABEL 99                                Common exit point
PRINT CLEAR PRINT LINE PRINT LINE       Two blank lines
TEST 26                                 Clear from cell
LABEL 98
PRINT LINE PRINT LINE PRINT LINE        Three blank lines
PRINT 25,0,'TEST SUMMARY:'
PRINT 39,0,SUMMARY PRINT LINE
PRINT '<FF>'                            Print a form feed (use CHR$ in BASIC)
END                                     End of test sequence
```

USING A PERSONAL COMPUTER

A test program can be created as a text file using a personal computer. The program is then transferred to the 2960 in learn mode using the GPIB or the RS-232 port. Once in memory or saved on disc, the computer can be disconnected and the test can be subsequently run on the 2960 whenever it is required.

A sample program for a user-defined test sequence is given below. This is for a PC connected to the GPIB and using GPIB address 06 for the 2960.

When the program is subsequently RUN, the test sequence puts the mobile into CONVERSATION mode and then proceeds to execute four receiver tests on the mobile using a redefined set of limits.

```
10   ! **RX TESTING**
20   !
30   DIM A$[100]                        Set maximum length of command A$
40   REMOTE 706                         Put 2960 into GPIB remote mode
50   READ A$                            Read the DATA command
60   OUTPUT 706 USING "K";A$            Send the command to the 2960
70   IF A$ <> "END" THEN GOTO 50        If A$ isn't END, go to line 40
80   GOTO 230                           If it is, go to end of program
90   DATA TSI 4                         Select user-defined test sequence
100  DATA "SEQTTL 'RECEIVER TESTING'"   Set the sequence title
110  DATA LEARN                         Put 2960 into learn mode
120  DATA TEST 20                       Registration on control channel
130  DATA TEST 21                       Call cell to mobile
140  DATA PAR 7,2,-115dBm,,5.7kHz       Set TEST 7 parameters
150  DATA TEST 7                        Measure Rx sensitivity
160  DATA PAR 6,1,12,5%,-107dBm         Set TEST 6 parameters
170  DATA TEST 6                        Measure Rx distortion
180  DATA PAR 6,1,36,,-80dBm,5.7kHz     Redefine TEST 6 parameters
190  DATA TEST 6                        Measure Rx distortion
200  DATA PAR 8,3,3%                    Set TEST 8 parameters
210  DATA TEST 8                        Measure Rx expansion
220  DATA END                           End of learn mode
230  END                                End of program
```

APPENDIX 1 COMMAND CODES

Command code	Function	Token	Syntax form	Data format	Modes
Aid	Set area identity number	DF	6	5 digits	I & L
	Read area identity number	-	1	-	I
BRi	Set baud rate for RS-232 port	96	2	1 digit	I & L
BUffer	Print printer array buffer	E3	4	-	L
CCH	Set current control channel	8F	2	4 digits	I & L
CCi	Set default control channel	8E	2	4 digits	I & L
CLear	Clear printer array buffer	E2	4	-	L
COMmand	Control 2955 directly in CRTS mode	9B	7	Text	I & L
CONtinue	Continue after pause	-	1	-	I
CRI	Set charge rate	DC	2	4 digits	I & L
	Read charge rate	-	1	-	I
CRTS	Change to CRTS mode	-	1	-	I
CSl	Enable/disable continuous summary lines	-	2	1 digit	I
DCc	Set digital colour code	DD	2	1 digit	I & L
	Read digital colour code	-	1	-	I
DEfault	Load default parameter data, execute any user-defined subroutine	82	1	-	I & L
DFi	Set display format	94	2	1 digit	I & L
DIsable	Disable printing	E0	4	-	L
DSCc	Set DSAT colour code	D5	2	1 digit	I & L
	Read DSAT colour code	-	1	-	I
DSi	Set disc step rate	-	2	1 digit	I
DTmf	Enable/disable DTMF test	DB	2	1 digit	I & L
	Read DTMF test setting	-	1	-	I
ECho	Enable/disable RS-232 echo	-	2	1 digit	I
ENAble	Enable printing	E1	4	-	L
END	End of program or user-defined subroutine, return to immediate mode	FF	1	-	L
ESn	Read equipment serial number	-	1	-	I
	Print or write ESN	F1	4	-	L
Fvc	Set first voice channel	91	2	4 digits	I & L
Gosub	Call subroutine at given label	89	2	3 digits	L
HF	Enable/disable hook flash test	DA	2	1 digit	I & L
	Read hook flash test setting	-	1	-	I
HInc	Set handoff increment	93	2	4 digits	I & L
Indicator	Print or write test status indicator	EE	4	-	L
JBC	Jump to label if designated bit is clear	A4	5	1 & 3 digits	L
JBS	Jump to label if designated bit is set	A5	5	1 & 3 digits	L
JEq	Jump to label if value is equal to flag register	A6	5	3 & 3 digits	L
JNe	Jump to label if value is not equal to flag register	A7	5	3 & 3 digits	L

Command code	Function	Token	Syntax form	Data format	Modes
JOE	Jump to label on test error	A2	2	3 digits	L
JOF	Jump to label on test failure	A3	2	3 digits	L
JOP	Jump to label on test pass	A1	2	3 digits	L
JUmp	Jump to label unconditionally	86	2	3 digits	L
Key	Wait for keypress and store value in flag register	9A	1	-	L
LAbel	Marker for position in program	85	2	3 digits	L
LEarn	Enter learn mode	-	1	-	I
LIne	Print first line of printer array buffer	E4	4	-	L
LOAd	Load a file from disc	-	2	1 digit	I
LOCal	Go to local control mode from RS-232	-	1	-	I
LPi	Set data length and parity of serial port	-	2	1 digit	I
LVc	Set last voice channel	92	2	4 digits	I & L
Min	Set mobile identity number	-	6	Number	I
	Read MIN	-	1	-	I
	Print or write MIN	F0	4	-	L
NExt	Next pass of repeat loop	88	1	-	L
NFI	Set number format	D9	2	1 digit	I & L
	Read number format setting	-	1	-	I
NOrmal	Go to normal 2955 mode	-	1	-	I
NXtch	Next channel and next RPTCH loop	8D	1	-	L
PARameter	Set test routine parameters	81	3	2 & 1 digits & text	L
PAUse	Pause at end of current test routine	-	1	-	I
PEI	Peek I/O port and place contents in flag register	9D	2	3 digits	I & L
PEM	Peek memory and place contents in flag register	9E	2	5 digits	I & L
PMi	Set pause mode	95	2	1 digit	I & L
POI	Poke I/O port with data	9F	5	3 & 3 digits	I & L
POM	Poke memory with data	A0	5	5 & 3 digits	I & L
PPi	Select printer port	97	2	1 digit	I & L
PRInt	Print to current printer port	83	4	2 & 2 digits & text/code	I & L
PRO	Set criteria for printing result of test routine	99	2	1 digit	I & L
PTi	Select printer terminator	98	2	1 digit	I & L
PUrge	Clear RS-232 or GPIB buffer	-	1	-	I
RD	Request a reading	-	2	3 digits	I
RECall	Recall settings	-	2	1 digit	I
REPeat	Repeat a loop	87	2	3 digits	L
RESult	Print or write test routine result	FC	4	-	L
RETurn	Return from subroutine	8A	1	-	L
RPtch	Repeat loop from current to last voice channel	8C	1	-	L

Command code	Function	Token	Syntax form	Data format	Modes
RUn	Run test sequence	-	1	-	I
SAve	Save current user-defined program on disc	-	2	1 digit	I
SBi	Set number of stop bits	-	2	1 digit	I
SCc	Set SAT colour code	DE	2	1 digit	I & L
	Read SAT colour code	-	1	-	I
SEqttl	Set title of user-defined test sequence	-	6	Text	I
	Print or write test sequence title	FA	4	-	L
SRq	Enable/disable service request	-	2	1 digit	I
STAtus	Print or write test routine status	ED	4	-	L
STOre	Store setting	-	2	1 digit	I
STPch	Step to next voice channel	8B	1	-	L
SUMmary	Print or write test routine summary	EF	4	-	L
SYStem	Set system type	-	6	2 digits	I
	Read system type	-	1	-	I
TEst	Execute following test routine	80	2	2 digits	L
TITle	Print or write current test routine title	FB	4	-	L
TSi	Select test sequence	-	2	1 digit	I
UPI	Read parallel control port user input lines	-	1	-	I
UPO	Set parallel control port user output lines	-	2	3 digits	I
USer	Enter user mode	-	1	-	I
VCh	Set current voice channel	90	2	4 digits	I & L
VMother	Read version of motherboard software	-	1	-	I
VPers	Read version of personality board software	-	1	-	I
WAit	Wait for n milliseconds	9C	2	5 digits	L
WRite	Write to 2955 screen at x, y	84	4	2 & 2 digits & text/code	I & L

2960 Supplement 30

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